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Model # : 2225/2226
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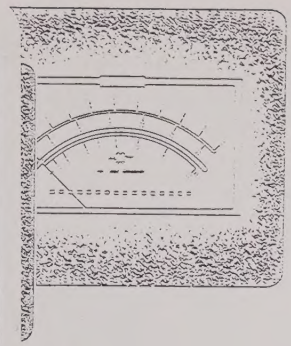
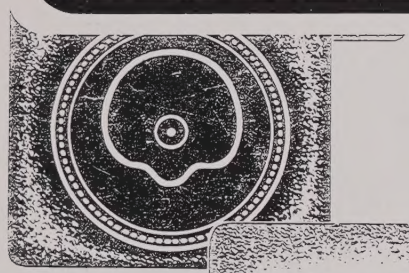
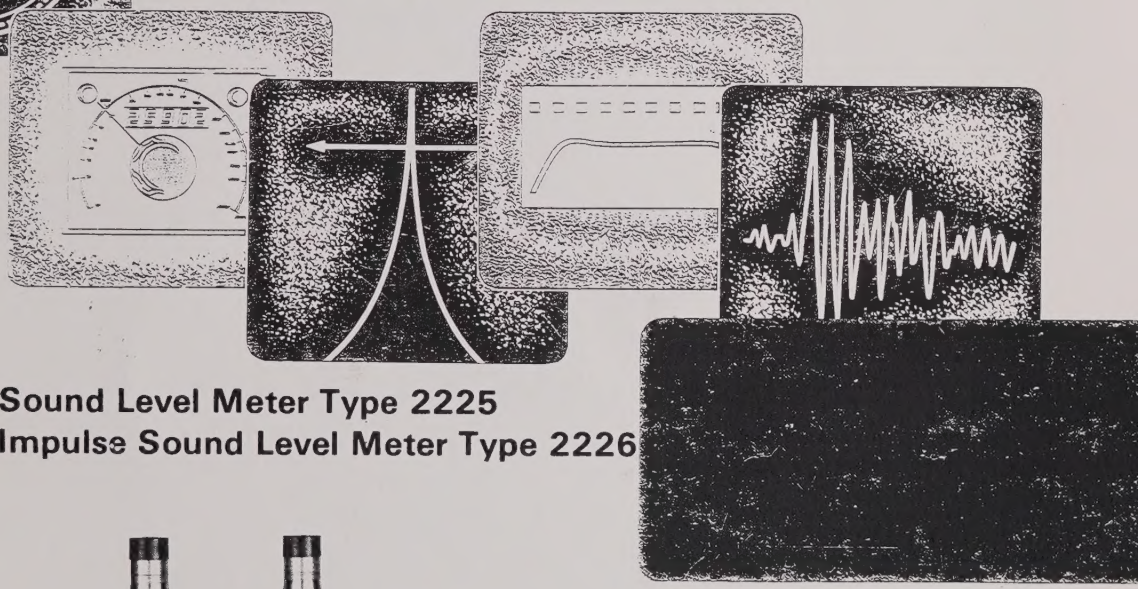


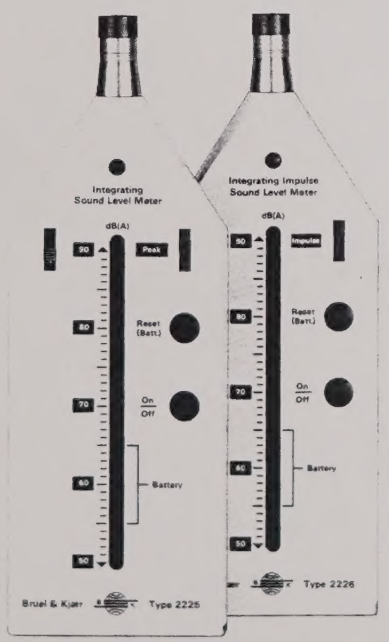
2225
2226

Instruction Manual





Integrating Sound Level Meter Type 2225
Integrating Impulse Sound Level Meter Type 2226



Two portable Sound Level Meters with easy-to-read "thermometer" display, complying with IEC 651 Type 2*, DIN 45634 and ANSI S1.4 - 1971 Type S2A. An A-weighting network is built-in. "Fast" and "Slow" time constants and a one minute L_{eq} easily converted to SEL (L_{AX}) on both meters. In addition the 2225 has a "Peak" hold and the 2226 an "Impulse" function and "Max. hold" facility on all time constants. The measuring range from 25 dB(A) to 140 dB(A) peak is covered in 4 overlapping 40 dB(A) ranges. Automatic reset and other features enable operators to make accurate valid measurements after a short period of familiarisation. DC output to a level recorder.
Supplied with Prepolarised Condenser Microphone Type 4175

* except for "Max. hold" on 2225

Brüel & Kjær

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INTEGRATING SOUND LEVEL METER
TYPE 2225

AND

INTEGRATING IMPULSE SOUND LEVEL METER
TYPE 2226

Applicable to instruments from Serial No. 796650

October 1979

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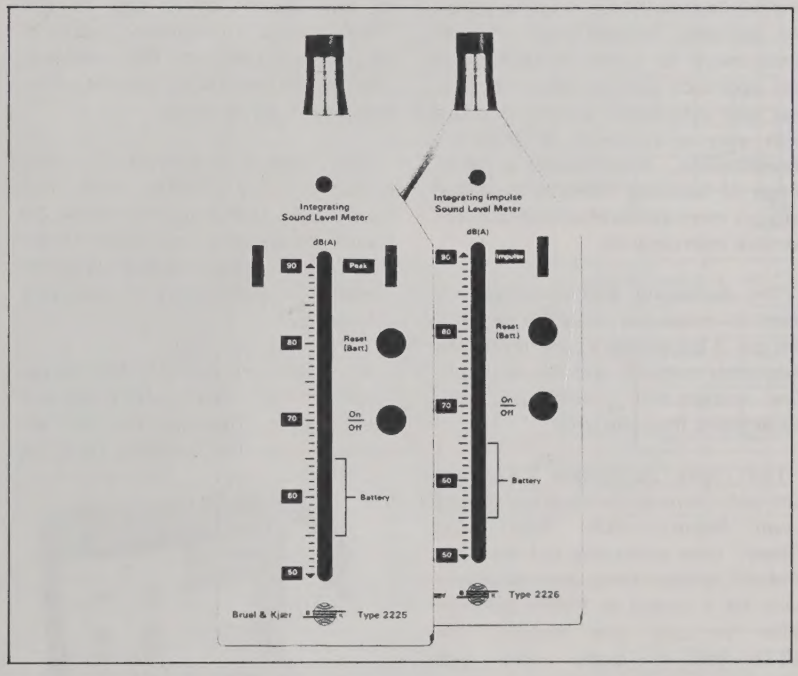
Integrating Sound Level Meter
type 2225

Integrating Impulse Sound Level Meter
type 2226

Robustly constructed in a compact case, the types 2225 and 2226 are go-anywhere instruments. Light in weight, but full of facilities for easy comprehensive A-weighted measurement of community or industrial noise.

The short-term (60 second) L_{eq} measurement, used on fluctuating signals, eliminates the errors inherent in averaging by eye and can also be used to obtain SEL(L_{AX}). "Slow", "Fast" and "Peak" hold (with a 30 μs rise time) are featured on the 2225. "Slow", "Fast" and "Impulse" all with "Max. hold" of the displayed level on the 2226.

Easily read "thermometer" display, automatic reset, and many other features which enable the operator to make valid and accurate measurements after a minimum of training. DC output of all functions continuously to a level recorder.



FEATURES:

- Sturdy, compact design (weight only 370 g)
- Short-term (one minute) L_{eq} with up to 50 dB crest factor
- Simple conversion to SEL(L_{AX})
- Fulfils IEC 651 Type 2*, DIN 45 634 and ANSI S 1,4 — 1971, Type S2A
- 25 dB(A) to 140 dB(A) peak measuring range
- "Slow" and "Fast" time constants with up to 40 dB crest factor
- A-weighted max-hold peak detector (2225 only)
- A-weighted impulse detector (2226 only)
- 40 dB "thermometer" display with 0,5 dB resolution
- Readable even in direct sunlight
- Equipped with robust B & K Prepolarized Condenser Microphone
- Built in A-weighting network
- Easy one handed operation
- DC output of all functions to a level recorder
- Automatic reset and switch-off
- "Max. hold"available on all functions (2226 only)

USES:

- Community and Industrial noise surveys
- Determination of L_{eq} for evaluation of noise annoyance or hearing loss risk
- Measurements of non-steady noise
- Determination of Sound Exposure Level, SEL(L_{AX})
- Assessment of the harmful effects of impact noise (2225 only)
- Assessment of the loudness of impulsive noise (2226 only)
- Measurement of maximum levels (2226 only)

* except for "Max. hold" on 2225

Introduction

Noise, as the cause of annoyance and hearing loss, is now a generally accepted problem, causing many countries and local communities to adopt anti-noise legislation of various type and severity. The responsibility for measuring noise and enforcing the limits often falls to the police, health officers, and other public officials who are not themselves noise experts. The Types 2225 and 2226 have been designed with these users particularly in mind. They fulfil the need for a simply operated, rugged meter which newcomers to noise measurement can approach without apprehension and use effectively and confidently with only a minimum of training. Nevertheless, they have a wide range of facilities hitherto available only on more comprehensive and expensive instruments.

The damaging and annoying effects of noise are basically dependent on 3 parameters, the level, the frequency content and the duration. The concept of L_{eq} combines these parameters into one unit.

The Types 2225 and 2226 are not only normal A-weighted Sound Level Meters with "Fast" and "Slow" time constants but also L_{eq} meters which integrate automatically for a period of 1 minute. They differ in only one respect. The 2225 has a "peak" hold with 30μsec rise time, necessary to evaluate the damaging effects of impulsive noise. The 2226 has an internationally standardised "impulse" detector, and a "Max. hold" mode on all functions.

The "thermometer" type display is by means of a row of 41 LEDs giving a 40 dB dynamic range with 0,5 dB resolution. This is achieved by lighting two adjacent diodes to indicate the half-value between. Display brightness is controlled automatically with respect to ambient light conditions via a photo-transistor and enables the display to be read easily, even in direct sunlight.

Range changes automatically bring the correct values into view in the windows which enumerate the display scale, and the chosen measurement mode is also displayed in a window. This ensures simple, error-free read-out.

Operating "Reset. Batt." displays the battery condition and resets the instrument, returning the display to the lowest point on the scale. Any subsequent measurement starts from this point, thus preventing false readings. Measurement restarts 200 m sec. after the switch is released so that local noise from the click (which is less than 100 ms long) does not interfere with measurement. Especially important at low sound levels and in the "Peak" mode. In addition, operation of any switch initiates the reset process as an insurance against unintentional false readings.

The meter is powered by 3 easily obtained 1,5 V alkaline cells (IEC Type LR 6) giving approximately 30 hours continuous operation under normal use. Their condition is easily checked on the display by operating "Reset. Batt.".

An internal timer turns the instrument off two minutes after the last reset occurs. This also has the advantage that the batteries are not run down if the instrument is accidentally switched on while being transported.

With a level recorder connected to the DC output, the automatic switch-off is disabled and on the 2226 the "Max. hold" facility is overridden so that sound levels can be recorded continuously. When in "60 s L_{eq}" mode the instrument is reset every 60 s, the maximum recorded value being the 60 s L_{eq}.

In the max. hold "Peak" mode the peak is held for 0,3 seconds while it is recorded. Examples of all possible output functions are shown in Fig. 1.

Short-term L_{eq} Measurements

L_{eq} is based on the equal energy principle and can be considered as the continuous steady noise which would have the same A-weighted acoustic energy as the real fluctuating noise measured over the same period of time.

This calculation is carried out automatically when measuring in the "60s L_{eq}" mode, the rising value of the currently accummulated L_{eq}

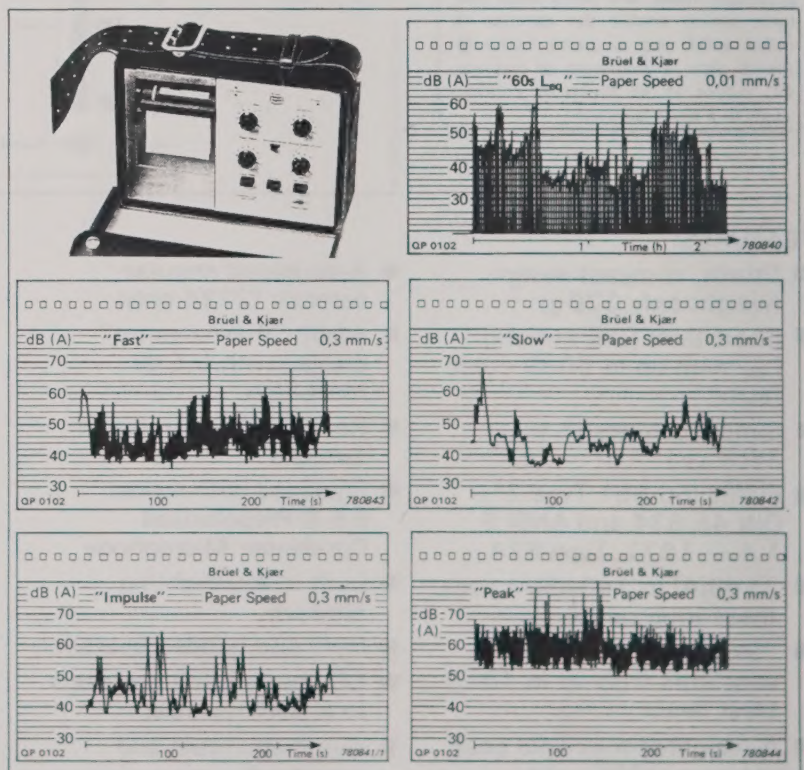


Fig. 1. The Portable Level Recorder Type 2306, and examples of recordings made with 2225 and 2226 in the various measurement modes

(Normalised to 60 s) being indicated on a *flashing* display to warn that the measurement is still in progress. On completion of a measurement the display stops flashing and the timer allows a one-minute readout period before turning the instrument off unless a reset occurs during this time. Operating any switch causes a reset.

The important advantage of displaying the normalised L_{eq} is that SEL(L_{AX}) can be obtained easily as soon as the event is over, simply by adding $10 \log_{10} 60$, (approx. 18 dB) to the reading. SEL (Sound Exposure Level) is the sound level which, if maintained constant for a period of 1 second, would contain the same A-weighted energy as the actual event. This is a useful parameter for comparing single events of different levels and duration, or in building up a long term L_{eq} from a knowledge of individual events and their frequency of occurrence.

Calibration

Calibration is easily carried out using Sound Level Calibrator Type 4230, which fits directly over the microphone producing 93,8 dB (±0,25 dB).

A windscreen is supplied and should always be used when making outdoor measurements.

Description

A composite block diagram is reproduced in Fig.2. A Prepolarized Condenser Microphone is fitted, which, combined with the small size of the meter case, gives the overall frequency and directional characteristics shown in Figs. 3 and 4. The attenuator, which splits the dynamic range into four overlapping 40 dB measuring ranges, is followed by a permanently connected A-weighting network. The weighted signal is fed to a logarithmic rectifier which performs a full-wave rectification and outputs the result in logarithmic form.

The detector, which performs true RMS detection, has the two standardized time constants "Fast" and "Slow". In addition Type 2225 has a "Peak" hold with 30 μs rise time, and the Type 2226 an "Impulse" detector to IEC and DIN specifications. For calculating a short-term average sound level in the "60 s L_{eq}" mode, the detector output is squared and integrated, the process being controlled by the timer. Crest factor capability of the detector is high, up to 50 dB. (See Specifications).

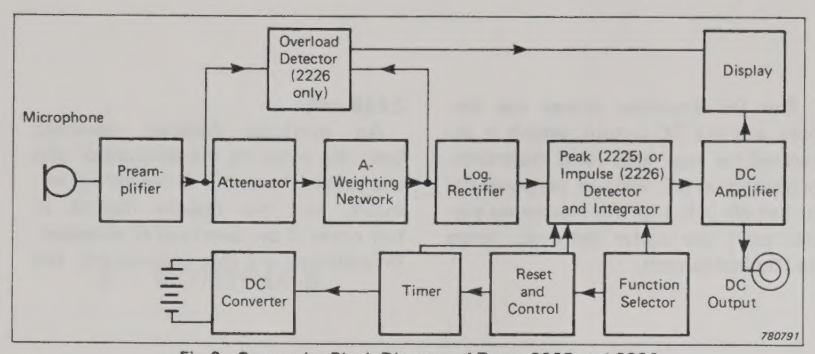


Fig.2. Composite Block Diagram of Types 2225 and 2226

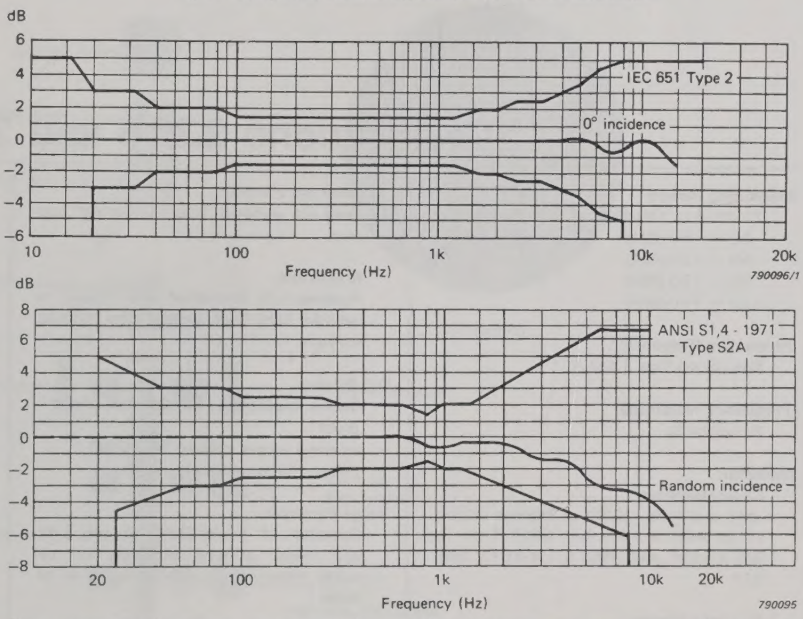


Fig.3. Free-Field frequency response of the complete instrument to sine waves with 0° incidence (upper) and random incidence frequency response (lower)

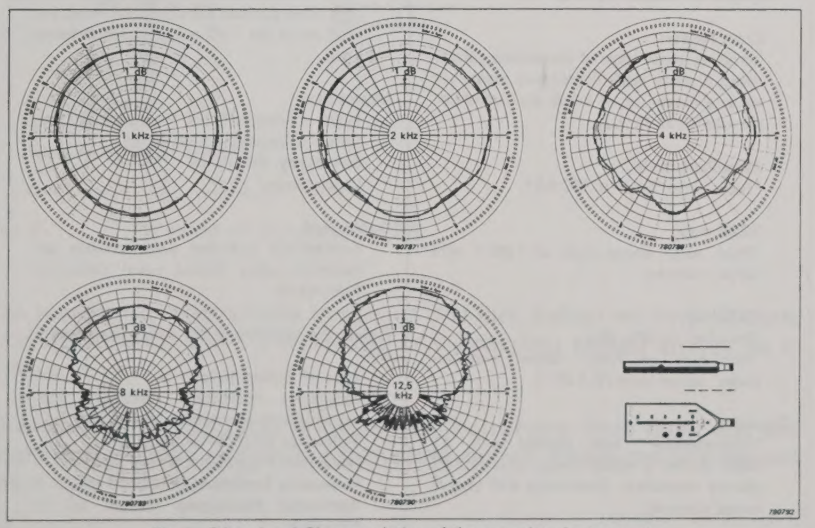


Fig.4. Directional Characteristics of the complete instrument

The DC amplifier drives the display and the DC output, which is intended for use with level recorders, providing a DC voltage proportional to the dB value of the measured signal with the same dynamic range as the instrument.

2226 only

An overload detector monitors both the input to the attenuator and the output from the A-weighting network, and the display flashes at full scale if an overload is detected. In addition, on this instrument, the maximum sound pressure level is held on the display until reset, continous operation of the display being obtained when the "DC Output" plug is inserted, or when the "DC Output" push-button supplied is depressed.

Specifications 2225 and 2226

Measuring Range:
25 dB(A) to 140 dB(A) peak in 4 ranges
20 — 60 dB(A)
50 — 90 dB(A)
80 — 120 dB(A)
100 — 140 dB(A)

Frequency Response:
See curves Figs. 3 and 4

Frequency Weighting:
A-weighting

Detector:

Characteristics:
RMS and Peak (2225) or Impulse (2226) in accordance with IEC 651* Type 2, DIN 45634 and ANSI S.1.4-1971 Type S2A

Dynamic Range:
60 dB(A) (40 dB(A) on scale + 20 over)
Limited by measuring range

Crest Factor:
20 dB at upper limit of measuring range, rising linearly with decreasing signal level to a maximum of 40 dB for Sound Level and 50 dB for L_{eq}

Time Constants:
"Slow" and "Fast" to IEC 651

2225 only:
"Peak hold" better than ±0,1 dB/s with 30 μs rise time

2226 only:
"Impulse" to DIN, IEC
"Max. hold" on "Fast", "Slow", and "Impulse" better than ±0,1 dB/s

Display:
"Thermometer" type display with 41 LEDs giving a 40 dB range with 0,5 dB display resolution. Overrange and underrange warning

Linearity:
Better than ± 0,25 dB

* except for "Max. hold" on 2225

Read out interval:
Read-out updated 1000 times per second

Brightness:
Automatically controlled with respect to external light level. Visible even in direct sunlight

DC Output:
Output impedance : 10 kΩ, short circuit proof
Nominal output voltage: 50 mV/dB
Offset : bottom of scale = 0 V

Reset Function:
Operation of "Reset (Batt.)" or any function resets all time constants and restarts measurement 200 msecs after release

Automatic Switch-off:
Instrument turns off automatically 2 minutes after the last switch is operated, except when the "DC output" plug is being used.

Microphone:
Type: 1/2-inch B & K Prepolarized Condenser Microphone Type 4175
Sensitivity: 50 mV/Pa
Capacitance: 12 pF

Calibration:
Screwdriver operated potentiometer adjustment using Sound Level Calibrator Type 4230

Reference Conditions for Calibration Validity:
Type of Sound Field: Free
Reference Incidence direction: Perpendicular to microphone diaphragm
Reference SPL: 94 dB (re 20 μPa)
Reference Frequency: 1 kHz
Reference Temperature: 20°C
Reference Measuring Range: 80 — 120 dB(A)

Effect of Magnetic Field: (at 50 Hz, 80 A/m (1 Ørsted)) < 20 dB(A)

Effect of Humidity: (at 40°C (104°F), 1000 Hz)
< 0,5 dB change in sensitivity in the range of relative humidities from 65% to 90%

Effect of Temparature: (at 1000 Hz)
Temperature range —10 to ± 50°C (re 20°C)
Temperature coefficient of microphone-/preamplifier —0,025 dB/°C
Temperature coefficient of complete instrument —0,025 (± 0,016) dB/°C

Warm-up time:
< 1 s

Batteries:

Type:
Three 1,5 V Alkaline cells IEC type LR 6 (B & K order No. QB 0013)

Life:
Approx. 30 hours continuous normal use
Approx. 10 hours in maximum sunlight

Overall Dimensions:
201 × 72 × 22 mm (7,9 × 2,8 × 0,9 in)

Weight:
370 g (0,8 lb) with batteries

Accessories included:
1 half-inch Prepolarized Condenser Microphone Type 4175
1 Leather carrying case KE 0177
1 2,5 mm mini-jack plug JP 0213
1 Windscreen UA 0459
3 cells QB 0013

Accessories Available:
Sound Level Calibrator Type 4230
Level recorder cable AO 0173
3 m microphone extension cable AO 0185 with threaded attachment (UNC 1/4" × 20) for direct connection to tripod
10 m cable as above AO 0186

2. CONTROLS

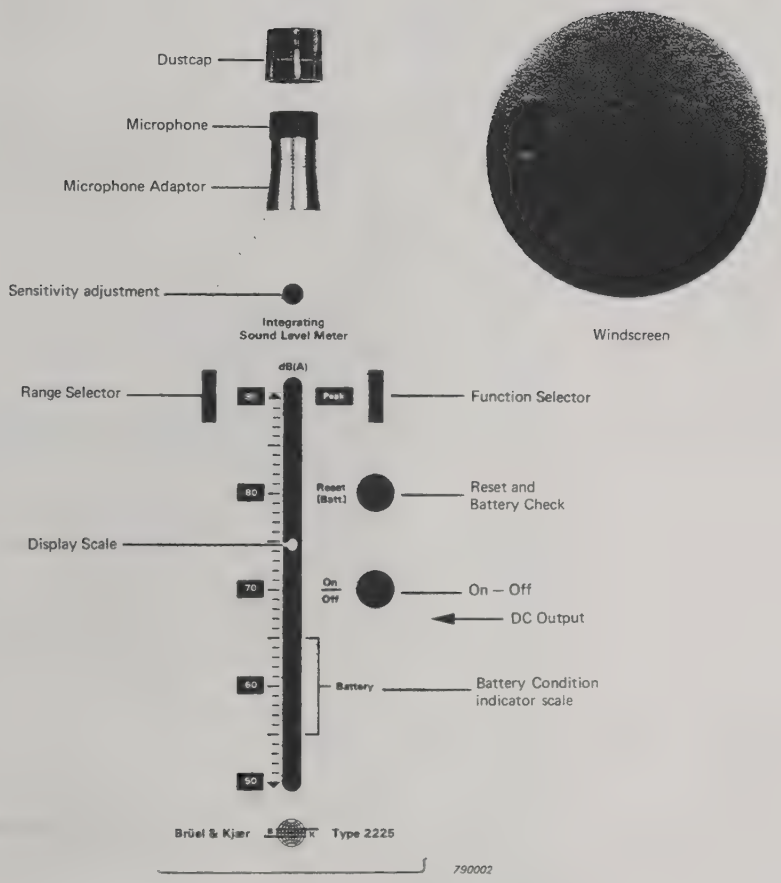


Fig.2.1. Front view of the Type 2225

DUST CAP: To protect the Microphone from dust and dirt. Except when calibrating the instrument, either the dustcap or windscreen should always be in place.

WINDSCREEN: Reduces wind noise and protects the Microphone from dust, dirt and light precipitation. Remove the dustcap before fitting the windscreen as it may be lost inside.

MICROPHONE: B & K half inch Prepolarised Condenser Microphone Type 4175. Although the Microphone cartridge can be unscrewed from the adaptor this is not recommended. The black protection grid at the top of the microphone is not removable. Special care should therefore be taken to make sure that foreign matter does not fall through the grid.

MICROPHONE ADAPTOR: The adaptor connects the microphone to the Sound Level Meter via a standard 5-pin DIN plug.

Note: Operating any of the following four switches; ON-OFF, RESET (BATT.), FUNCTION SELECTOR, or RANGE SELECTOR, causes the instrument and the timer which controls L_{eq} measurement and the automatic "switch-off" facility to be reset.

ON-OFF: Push-button for switching the instrument on and off. The display should operate immediately when switched on. The instrument switches off automatically two minutes after last reset. This feature is overridden when the DC OUTPUT plug is inserted.

RESET (BATT.): Push-button switch which, when pressed, displays the battery condition on the scale. If the level is below the BATTERY region of the scale, the batteries must be replaced. See Section 3.2. This switch also resets the meter, i.e. it starts a new measurement in 60 s L_{eq} mode, resets the peak hold and RMS detectors and resets the automatic "switch-off" time.

FUNCTION SELECTOR: Four position slider - switch as follows:

"Fast" provides the standardised "Fast" detector response for measuring steady sound levels.

"Slow" provides a "Slow" detector response for use when the sound level fluctuates too rapidly in the "Fast" mode for accurate reading.

"60 s L_{eq}" Integration of the sound level takes place for a fixed period of one minute during which the flashing display indicates the current accummulated dose. When measurement is completed, the display stops flashing and the 60 s L_{eq} is indicated for a read-out period of one minute. The instrument is then automatically switched off if none of the instrument's switches are operated during this period.

"Peak" (2225 only) holds the maximum peak value until the meter is reset. Rise time is 30μs.

"Impulse" (2226 only) Provides the "Impulse" detector response for the evaluation of the subjective response of impulsive sounds. **Note:** If an overload is detected in any mode, the display of the 2226 flashes at full scale deflection.

RANGE SELECTOR: A four position slider-switch for selection of four overlapping measuring ranges. Windows at 10 dB intervals alongside the display serve to enumerate the scale automatically.

DISPLAY: 40 dB "Thermometer" type display with 41 LEDs giving a read-out resolution to 0,5 dB (two adjacent LEDs on). The display brightness is controlled by a photo-transistor, and is readable even in direct sunlight. Uppermost or lowermost LEDs indicate out-of-range.

SENSITIVITY ADJUSTMENT: Removing a small plastic plug gives screwdriver access to the potentiometer. The gain may be adjusted (over a 10 dB range) to allow for small variations in microphone or meter sensitivity.

Fig.2.2. Right-hand side view of the Type 2225 or 2226 showing DC OUTPUT socket

DC OUTPUT: Socket providing a DC voltage proportional to measured level (50 mV/dB). Output impedance 10 kΩ. Accepts 2,5 mm mini-jack plug (B & K No. JP 0213). When in use the automatic switch-off is disabled, and in addition, in the case of the 2226, "Max. hold" is overridden and normal continuous operation of the instrument's display is obtained. Levels can be continuously fed to a recorder in "Fast", "Slow" and "Impulse" (2226 only). In "60 s L_{eq}" the accummulated dose is output until the 60 s L_{eq} is reached after one minute and then the measurement is restarted. In "Peak" (2225 only), the maximum peak detector is reset automatically whenever a higher peak occurs. The peak value is held for a period of 0,3 s, after which the detector is reset, unless a higher peak value occurs during that time, causing an immediate reset. The stored peak value is output continuously. With the 2226 only, overload is indicated by a high DC output.

TRIPOD MOUNTING BUSH: Located near the bottom of the rear of the instrument case. The thread is UNC 1/4" × 20, the standard tripod mounting thread.

3. OPERATION

3.1. INTRODUCTION

This Instruction Manual describes the specific procedures necessary to use the Integrating Sound Level Meter Type 2225 and Integrating Impulse Sound Level Meter Type 2226 correctly. However, many other more general aspects of sound measurement must be considered in order to be sure of obtaining accurate, reproducible measurements. Many of these are discussed in the accompanying booklet "Measuring Sound" which should be read in conjunction with this Instruction Manual.

In addition, for many purposes measurements may have to be made in a way and with equipment which are closely specified by National or International standards, e.g. aircraft noise or industrial hearing damage risk measurements. Failure to comply with these standards may result in invalid data. It is therefore recommended that reference be made to the standards applicable to the particular measurement situation.

3.1.1. General Considerations

1. Store the instrument in a dry warm place.
2. Remove batteries if stored for a long time.
3. Connect microphones or adaptors with power off.
4. Use light finger torque only when fitting the microphone to the adaptor.
5. Keep dust and foreign objects away from the microphone diaphragm.

3.2. BATTERY INSTALLATION

The Types 2225 and 2226 are powered by three 1,5 V alkaline cells, IEC Type LR6 (B & K QB 0013). These are inserted into the rear of the instrument as shown in Fig.3.1 after making sure the instrument is "Off" and sliding off the battery compartment cover.

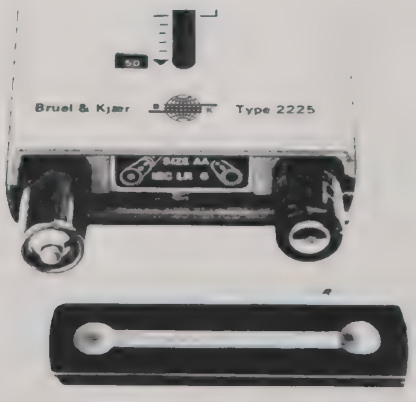


Fig.3.1. Battery replacement

The polarities should be as indicated on the case. New cells will provide about 30 hours continuous operation in normal conditions, or 10 hours in direct sunlight. Batteries should be replaced whenever the battery condition indication, obtained by pressing RESET (BATT.), falls below the region indicated on the display.

It is recommended that only alkaline batteries, such as those supplied with the instrument, are used.

3.3. MOUNTING THE MICROPHONE

The microphone is screwed directly onto the adaptor, using light finger torque. The assembly may then be plugged directly into the sound level meter via its 5 pin DIN plug (see Fig.3.2) or connected via a 3 m or 10 m extension lead available under order numbers AO 0185 and AO 0186 respectively. The microphone end of the extension lead has a threaded attachment to enable it to be connected directly to a standard tripod screw. This arrangement allows the operator to be close to the sound level meter for reading purposes, while at the same time enabling him to be well away from the microphone, and therefore not influence the sound field.

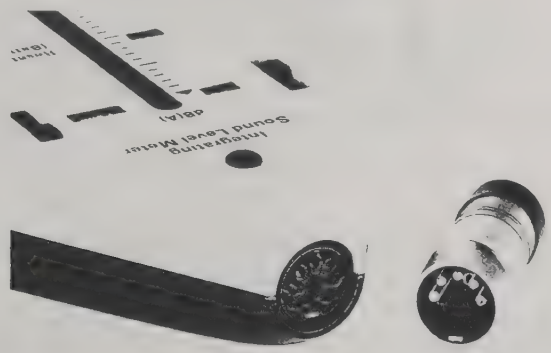


Fig.3.2. Microphone, adaptor and connection to the sound level meter

3.4. CALIBRATION

The Sound Level Calibrator Type 4230 is recommended for acoustical calibration of the whole instrument, including microphone. The 4230 is basically a miniature loudspeaker with a stabilised output of 94 (± 0,25) dB (re. 20×10^{-6} Pa.) at 1 kHz. The calibration procedure is as follows:

1. Mount the microphone, switch power on and press RESET. BATT. to check the batteries of the Sound Level Meter. The instrument will switch off automatically two minutes after a Reset occurs.

2. Fit the Sound Level Calibrator with the half-inch adaptor. (B & K part No. DB 0311)

3. Remove the dust cap or windshield from the microphone and fit the calibrator over the microphone so that it seals properly. See Fig.3.3.

4. Set the RANGE SELECTOR to the "80 to 120 dB(A)" range and FUNCTION SELECTOR to "Fast" detector setting.

5. Remove the small, push-fit, plastic plug on the top front of the instrument to gain access to the sensitivity adjustment potentiometer.

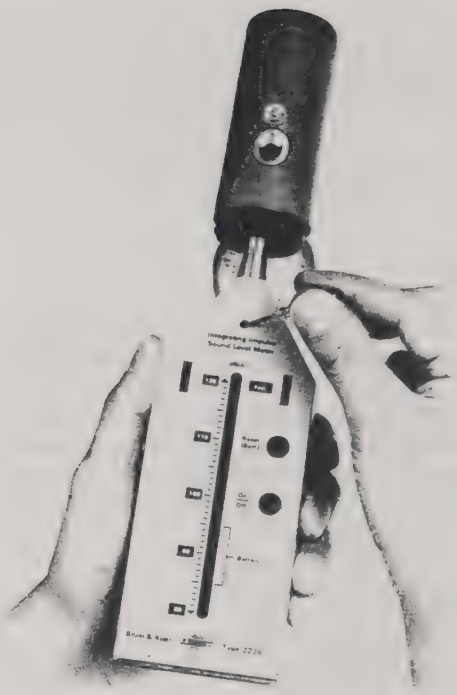


Fig.3.3. Calibrating the instrument

6. Switch the Calibrator on and adjust the potentiometer with a small screwdriver as in Fig.3.3 so that the LED at the 93 dB position just extinguishes but the 94 dB LED is lit when "moving up" the scale, i.e. turning the sensitivity potentiometer screw clockwise. This gives a calibration of 93,8 dB to correspond with the half-inch free-field microphone sensitivity, with an accuracy of ±0,1 dB.

   This process is made easier with the Type 2226 if the DC Output plug is inserted to override the "Max. hold" facility. This gives a display which is continuously adjustable both up and down instead of held at the maximum value by the "Max. hold" circuit, requiring continual resetting.

7. Remove the Calibrator gently. It will turn off automatically.

8. Replace the dustcap or windscreen.

The Sound Level Meter is now calibrated and ready for use.

3.5. SOUND LEVEL MEASUREMENTS

3.5.1. General

The accompanying booklet "Measuring Sound" should be read before proceeding with measurements. Always use a Windscreen outdoors or in dusty environments and ensure that the measuring position is suitable and that the background noise level is low enough to make valid readings. In order to minimise the effect of reflections, the observer should hold the instrument at arms length or mount the microphone remotely on a tripod using a connection cable.

3.5.2. Procedure for Sound Level Measurements

1. Calibrate the meter and check the batteries. See Section 3.4.

2. Set the FUNCTION SELECTOR switch as follows:

"Fast"	for normal sound level measurements.
"Slow"	if the display fluctuations in the "Fast" position are too large or too fast for accurate readings.
"60 s L_{eq}"	If a longer averaging time is required to obtain meaningful short term measurements of fluctuating or cyclical noise, or when an L_{eq}, noise dose, or SEL(L_{AX}) is required directly. For example, for the evaluation of noise annoyance (L_{eq}), the assessment of hearing damage risk (noise dose), or comparison of the annoyance of similar events (SEL(L_{AX})).
"Peak"	**(2225 only)** to hold the maximum peak value of the signal.
"Impulse"	**(2226 only)** to obtain the **subjective** level of impulsive sounds.

Note: The normal mode of operation of the Type 2226 is "Max. hold". Continuous display of fluctuating Sound Pressure Levels can be obtained simply by inserting the "DC Output" plug.

3. Set the RANGE SELECTOR switch so that the level indicated is in a convenient position on the display which does not exceed full scale or cause overload.

4. It may sometimes be necessary to make measurements in the presence of background noise, which will contribute to the measured level and for which a correction

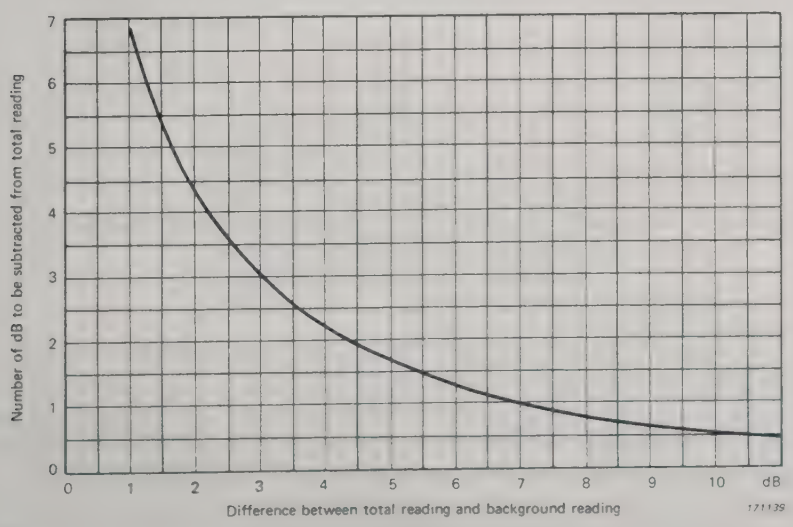


Fig.3.4. Correction curve for the influence of background noise

must be made. Readings should be made for the source operating in the presence of background noise, and for the background noise alone. A correction can then be made according to the curve of Fig.3.4. The difference between the two values is found, and the correction curve is entered on the horizontal axis at this value. The corresponding correction value obtained from the vertical axis is then subtracted from the higher of the two measured values.

5. To make a new measurement in "60 s L_{eq}, "Peak" **(2225 only)** or "Max. hold" **(2226 only)** mode, press RESET (BATT.)

3.5.3. Noise Dose Measurements

What the instrument measures in the "60 s L_{eq}" mode is a noise dose referred to 1 minute. If this L_{eq} is referred to a time duration of 8 hours by subtracting approx. 26,8 dB (10 $\log_{10}$ (8 × 60)) it can be expressed as a percentage of the allowable dose for that period. A nomogram for estimating the percentage of allowable noise dose for an 8 hour working day from the meter reading is reproduced in Fig.3.5. This applies to ISO only.

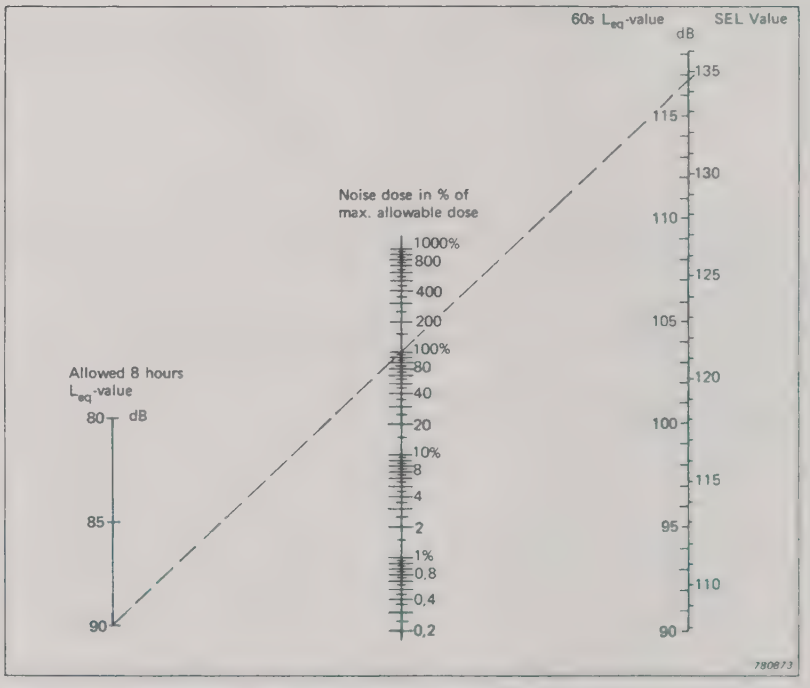


Fig.3.5. Nomogram for estimating daily noise dose or SEL(L_{AX}) from meter reading

3.5.4. SEL(L_{AX}) Measurements

SEL is the Sound Exposure Level and is basically an L_{eq} normalised to a duration of 1 second. It is used primarily to rate individual noise events, either to compare them with regard to annoyance, or to evaluate an overall noise climate by combining a number of individual events whose level and frequency of occurrence are known. The procedure is exactly as in 3.5.2, for "60 s L_{eq}" measurement, except that the reading may be taken as soon as the event is over, without waiting for the full minute measuring period to elapse. To this measured value just add approx. 18 dB (10 $\log_{10}$ 60) to convert to SEL (L_{AX}).

4. USE WITH OTHER INSTRUMENTS

4.1. DC LEVEL RECORDING

The Portable Level Recorder Type 2306 is well suited for use with the Types 2225 and 2226, being operated from internal batteries. It is connected directly to the "DC OUTPUT" of the meter via a cable (B & K order Number AO 0173) with a standard BNC plug at the recorder and a standard 2,5 mm mini jackplug at the meter. When this is inserted it overrides the automatic "switch-off" feature and the "Max. hold" mode of the 2226 allowing the meter to run continuously in all modes of operation. In "60 s L_{eq}" the accumulated value is continously recorded, the final value being the L_{eq} for one minute, and the meter is reset to start a further "60 s L_{eq}" measurement.

In "Peak" **(2225 Only)**, the maximum peak is held for 0,3 s and then reset, unless a higher peak occurs during that time, causing an immediate reset.

The procedure is as follows:

1. Calibrate the meter (including checking the batteries) as in Section 3.4.

2. Ensure that the POLARITY REVERSER of the 2306 is in the + position and that no leads are connected to SIGNAL INPUT.

3. Set RECORDING MODE slider-switch on the 2306 to "DC Lin" and select the required writing and paper speed. A 250 mm/s writing speed is recommended as this is fast enough to faithfully reproduce the levels even in the "peak" mode of the 2225.

4. Using DC LIN POSITION adjust the pen position to lie exactly on the lower line of the paper. See Fig.4.1.

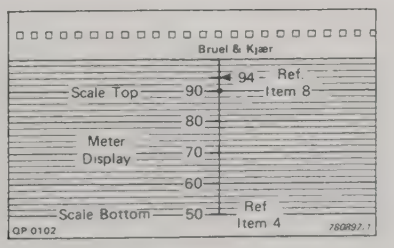


Fig.4.1. Calibrating the Type 2306 using the Type 4230 calibrator

5. Connect the DC OUTPUT of the Type 2225 or 2226 to the SIGNAL INPUT of the 2306 using cable AO 0173.

6. Place the Sound Level Calibrator Type 4230 over the microphone, switch on both calibrator and sound level meter and set FUNCTION SELECTOR to "Fast".

7. Slide the RANGE SELECTOR of the meter to give the 50 to 90 dB(A) range.

8. Adjust the SENSITIVITY potentiometer on the 2306 so that the pen lies exactly on the third line from the top of the recording paper. This position should be noted as the 94 dB calibration level. See Fig.4.1. The meter will indicate full scale deflection (90 dB(A)), but the DC output will be unaffected i.e. it will give an output corresponding to 94 dB as the instrument has 20 dB extra range over that displayed.

9. Select suitable measuring range on the RANGE SELECTOR and set FUNCTION SELECTOR as required. Remember to note the range used on the Level Recorder paper. For any range chosen the bottom line on the paper corresponds to the lowest value on the instrument display scale, when the above procedure is followed.

The Level Recorder is now calibrated and ready for use.

Alternative Calibration Method

The following procedure can be carried out without using a calibrator, but therefore assumes that the Sound Level Meter is itself correctly calibrated.

1. Carry out steps 2 to 5 as above

2. Slide the RANGE SELECTOR of the meter to give the range 50 to 90 dB(A) and select 60 s L_{eq} on the FUNCTION SELECTOR.

3. Obtain a steady reading in the upper region of the display, by clapping the hands for example. As an example, suppose a reading of 84 dB(A) is obtained.

4. Adjust the pen position using the SENSITIVITY potentiometer of the 2306 so that it indicates the displayed value on the paper. (See Fig.4.2) The top of the meter display should correspond to the 2nd thick line from the top of the recording paper and the bottom of the display correspond to the bottom line on the paper.

5 Select suitable measuring range on the RANGE SELECTOR and set FUNCTION SELECTOR as required. Remember to note the range used on the Level Recording Paper. For any range chosen, the bottom line of the paper corresponds to the lowest value on the instrument display scale, when the above procedure is followed.

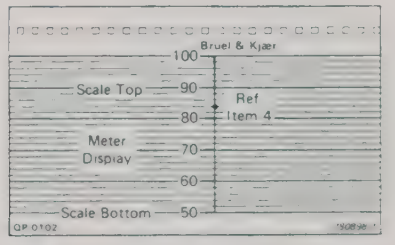
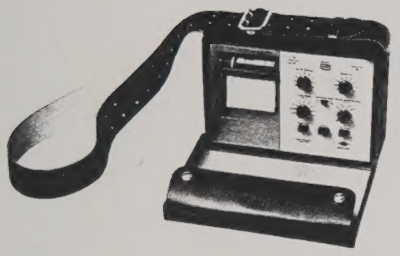
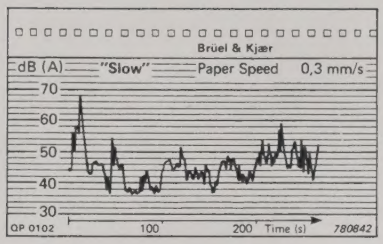
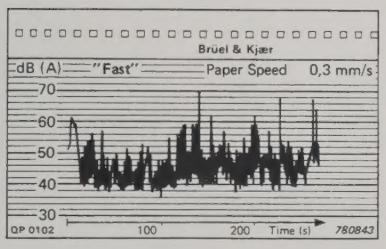


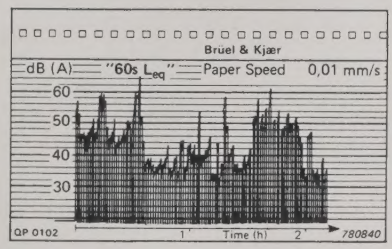
Fig.4.2. Calibrating the Type 2306 using Alternative method

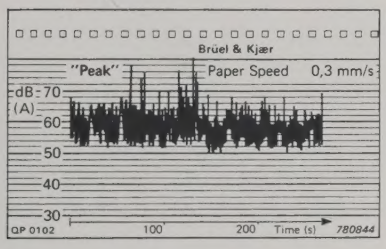
Typical examples of recordings made with various meter functions are shown in Fig.4.3











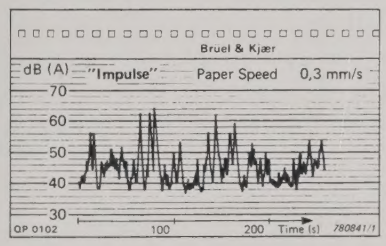


Fig.4.3. Examples of office noise recorded on the Portable Level Recorder Type 2306 using the various functions of the 2225 and 2226

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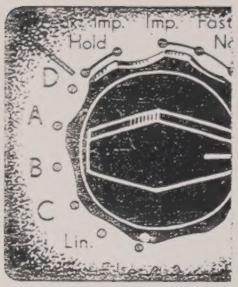

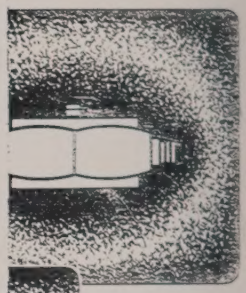

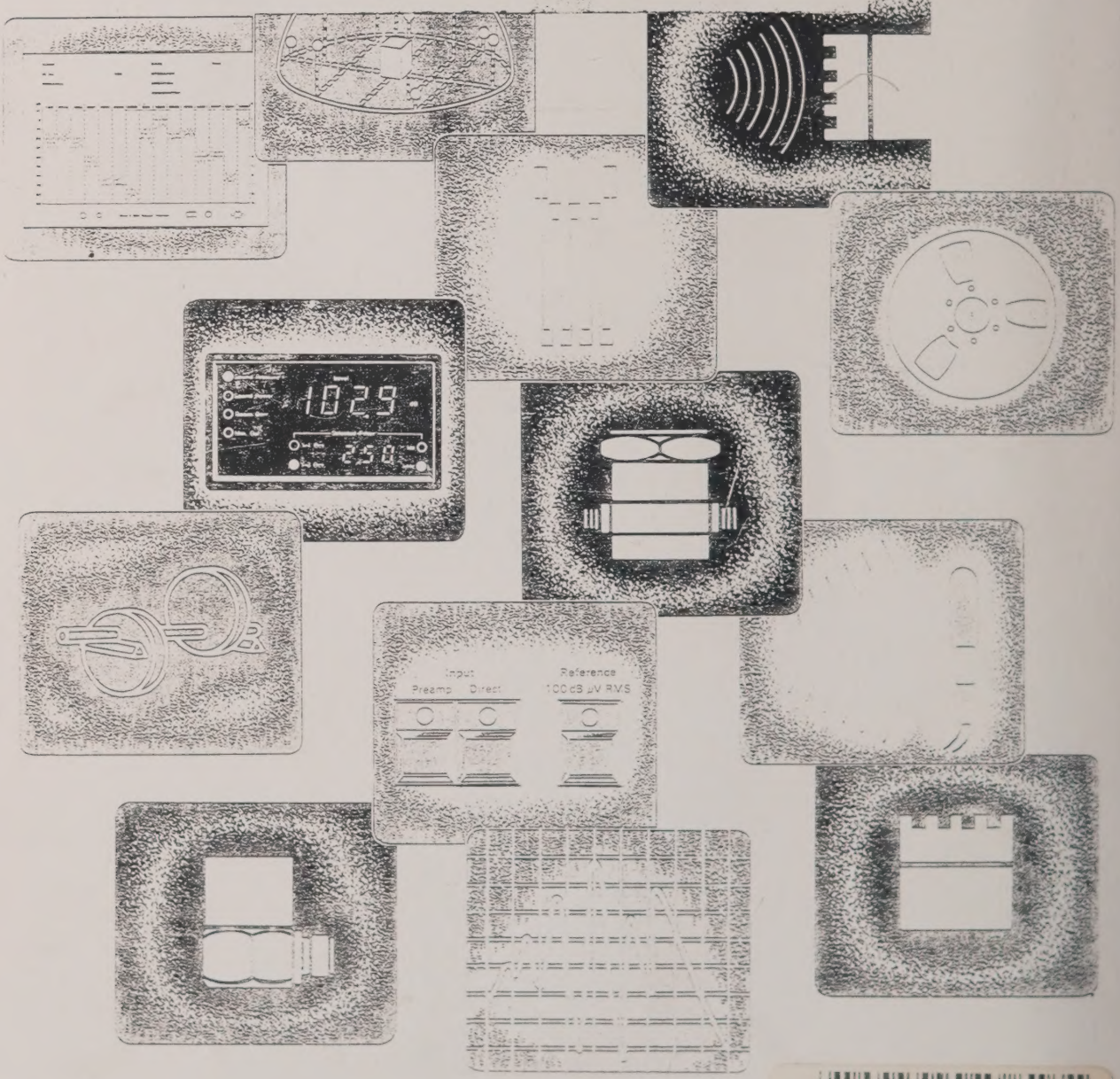

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